Report of the Survey on Laboratory Accidents in Secondary Schools for the 2017/2018 School Year

Background

The results of survey of Laboratory Accidents from 2002/03 onwards

As one of the ways to monitor the standard of safety in school science laboratories, survey of laboratory accidents occurring at schools were conducted since the 1995/1996 school year. From the 2002/2003 school year onwards, the survey has been conducted on a triennial basis. The findings from the survey are disseminated to all secondary schools to provide updated information on common laboratory accidents, so that preventive measures can be taken. This report presents findings of the survey for the 2017/2018 school year.

Results and Observations

2. A total of 426 secondary schools responded to the survey for the 2017/2018 school year, in which 323 (76%) reported that there were no laboratory accident cases. A total number of 283 accident cases were reported, in which 247 students and 4 members of staff were injured. Most of the injuries were minor. The majority of the cases (99%) were due to carelessness of students. Detailed statistics of the survey are shown in the **Appendix**.

3. Cuts and heat burns/scalds were the most common laboratory accidents accounting for about 36% and 50% of the cases reported respectively. A breakdown of the number of cases in different types of reported accidents is listed in the **Appendix**. A summary of the accidents reported is shown below:

(a) **Cuts**: Most cases involved small cuts caused by broken glass apparatus (e.g. test tubes, beakers, delivery tubes), tools (e.g. dissection instruments, blades, scissors) or sharp edges. Injuries were mostly made on fingers and palms. About 63% of the cases under this category occurred in Science (S1-3) lessons and 23% in Biology lessons.

(b) **Heat burns or scalds**: Most cases were mainly caused by carelessness in handling hot objects (e.g. tripods, crucibles, tongs, combustion spoons, glassware), hot liquids or Bunsen flame. About 81% of the cases under this category occurred in Science (S1-3) lessons and 15% in Chemistry lessons. Slight heat burns on hands were most common.

(c) **Eye accidents**: All cases reported were minor ones. Many cases involved splash of liquid chemicals onto the eyes, giving rise to slight irritation or discomfort. In one case, dilute acid was splashed onto the eyes of a student causing discomfort.

(d) **Chemicals on skin**: Only six cases were reported. The cases involved spillage of chemicals during transfer and mixing of chemicals. The chemicals involved were sodium hydroxide, dilute acid, hydrogen peroxide, dilute iron(II) sulphate and silver nitrate.

(e) **Chemical spillage**: All the cases were minor ones. In one case, mercury was spilled on the floor. Fortunately, no injury was reported in this case.

(f) **Discomfort arising from inhalation of gases**: Only one case was reported. In this case, when a laboratory technician was preparing chlorine gas in a fume cupboard inside the chemistry laboratory where there were no students, the gas diffused to the adjacent science laboratory in which students were having a lesson. Some of the students inhaled the gas and felt discomfort. The students were taken to hospital for treatment and all of them were discharged on the same day.

(g) **Substances catching fire**: Only four cases were reported and no injury was involved. In one case, a rechargeable battery got overheated during charging and ignited.

(h) **Bites by animals**: No case under this category was reported.

(i) **Others**: All reported cases under this category were very minor ones. In two of the cases, the students swallowed copper(II) sulphate crystal.

4. Information on the usage of science laboratories in schools was also gathered in this survey and the following accident rates were computed:

(a) **Accident rate per 1,000 students**: The schools reported that in the 2017/2018 school year, there were 283 accident cases and a total of 252,072 students (S1-6) studied science courses. This corresponded to an accident rate of 1.12 cases per 1,000 students studying science courses, and it is comparable to the rate of 1.10 from the survey for the 2014/2015 school year.

(b) **Accident rate per 10,000 practical periods**: The schools reported that in the 2017/2018 school year, a total of 908,918 periods were conducted with science practical activities, including student experiments, teacher demonstrations, preparation/try-out of experiments, project work and science club activities. This corresponded to an accident rate of 3.11 cases per 10,000 practical periods, i.e. a slight decrease in the rate in the

2017/18 school year when compared with the rate of 3.22 from the survey for the 2014/2015 school year.

Recommendations

5. Although accidents resulting in serious injuries rarely occur in school science laboratories, schools should continue to be on the alert and take active measures to reduce laboratory accidents to a minimum.

(a) Enhancing Safety Awareness of Laboratory Users

Different resources have been developed to enhance the safety awareness of laboratory users. Teachers and laboratory technicians may refer to the handbook "Safety in Science Laboratories (2013)" (http://cd1.edb.hkedcity.net/cd/science/laboratory/safety/SafetyHandbook2013_English.pdf) for the related information. New laboratory safety posters and hazard warning labels have been produced for schools to collect (https://edb.gov.hk/attachment/en/curriculum-development/kla/science-edu/ref-and-resources/collection_form_safety_Sep2018.pdf).

Safety equipment such as protective gloves has been included in the "List of Furniture and Equipment" for the Senior Secondary (SS) Science curricula (http://www.edb.gov.hk/en/sch-admin/sch-premises-info/furnitur/equipment/primary-secondary-schools.html). Teachers, laboratory technicians and students may use the equipment for conducting experiments where appropriate so as to enhance laboratory safety.

Besides, the following learning package is available at the EDB website to facilitate teachers to plan and conduct lessons on laboratory safety:
Learning and Teaching Resources on Safety in Science Laboratories
(http://cd1.edb.hkedcity.net/cd/science/laboratory/SAFETY/safety_exemplars_e.pdf)

(b) Enriching Knowledge of Laboratory Safety and Management

A series of web-based courses on laboratory safety and management has been developed to enrich teachers and laboratory technicians with the knowledge of laboratory safety and management with a view to maintaining high safety standard of school laboratories. The courses also aim to facilitate schools to plan and conduct regular laboratory safety training for their science teachers and laboratory technicians, provide adequate training for newly appointed teaching and laboratory staff, and facilitate science teachers and laboratory technicians to get access to different

information on laboratory safety and management whenever need arises. There are a total of 18 courses covering topics from general safety and management in school laboratories to subject specific safety practices. For details, please refer to the following website.
(http://minisite.proj.hkedcity.net/safetyonline/eng/index.html)

(c) Risk Assessment

In science learning, students are encouraged to conduct more inquiry-based experiments and scientific investigations/STEM[1] related projects. Risk assessment before practical activities is especially important to ensure safety in the laboratory. Teachers, laboratory technicians and also students should be able to recognise potential hazards, assess risks associated and take corresponding control measures and precautions to control the risks. Schools may refer to material safety data sheets (MSDS) for the safety information about chemicals and other relevant information when conducting risk assessment (http://cd1.edb.hkedcity.net/cd/science/laboratory/safety/msds_ss_2000.pdf).

(d) Standing Committee on Laboratory Safety

Laboratory safety is everyone's responsibility. We need a constant and concerted effort to maintain the standard of laboratory safety in schools. In order to establish and maintain an effective safety management system, all secondary schools are advised to set up a standing committee on laboratory safety (SCLS) or a school safety management committee to better equip schools with capacity to deal with emergency situations. It is also important for the committee to meet regularly so that the members could coordinate and monitor the safety measures more closely, and review the laboratory management practices more systematically.

(e) Disposal of Chemical Waste

Improper disposal of chemical waste may lead to laboratory accidents. For proper handling of chemical waste, schools are strongly recommended to follow the Guide on the Segregation, Packaging, Labelling and Storage of Laboratory Chemical Wastes for Schools prepared by Environmental Protection Department, which is available at http://cd1.edb.hkedcity.net/cd/science/laboratory/waste/cw_e.htm.

Concluding Remarks

6. The statistics of the survey of the 2017/18 school year reveal that schools have

[1] STEM is an acronym that refers to the academic disciplines of Science, Technology, Engineering and Mathematics.

maintained a high standard of laboratory safety, and has shown a comparable standard of laboratory safety to the last survey. Nevertheless, schools should continue to take a proactive role in monitoring the standard of laboratory safety. Based upon the fact that about 99% of accident cases were due to carelessness of students, students' attitudes towards and knowledge of safe practices in laboratories should be enhanced. Laboratory safety should be emphasised for each and every practical activity. Risk assessments should be made in advance and suitable personal protective equipment should be worn when conducting experiments. For more guidelines and resource materials on laboratory safety, please refer to the website of Science Education – Laboratory Safety and Management.

https://www.edb.gov.hk/en/curriculum-development/kla/science-edu/ref-and-resources/lab-safety-and-management.html

Science Education Section
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Appendix

Statistics of the Survey on Laboratory Accidents in Secondary Schools

2017/2018 School Year

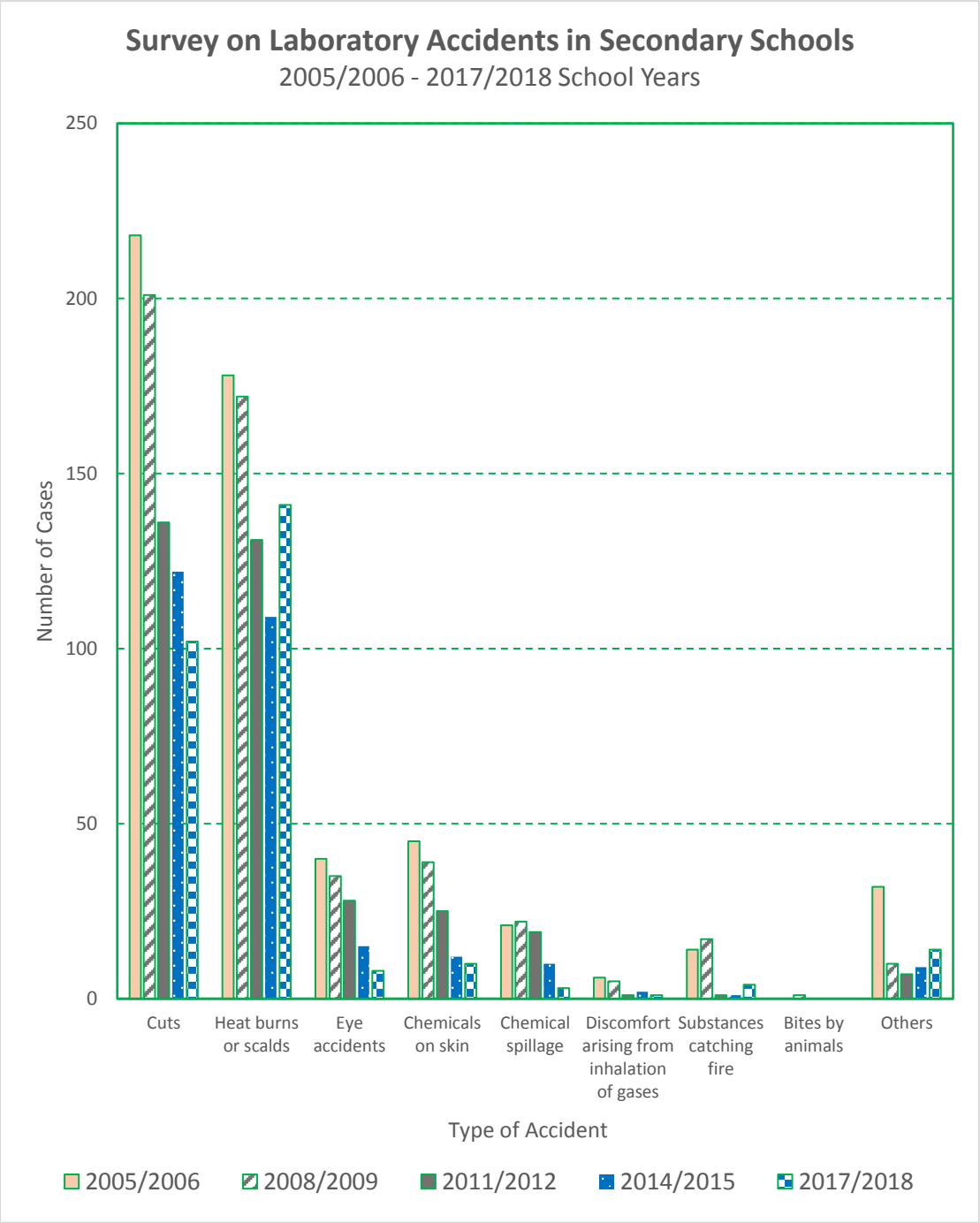
Summary of Survey Results	
Number of schools responded	426
Number (percentage) of schools reported laboratory accidents	103 (24%)
Total number of accident cases	283
Number of accident cases per school	0.66
Total number of students injured*	247
Total number of staff injured*	4
Accident rate per 1,000 students studying science courses**	1.12
Accident rate per 10,000 practical periods	3.11

* Most of the injuries were minor ones, e.g. minor cuts, heat burns or scalds on hands.

** In 2017, the traffic accident rate in Hong Kong was 2.13 cases per 1,000 population (Source: Road Traffic Accident Statistics 2017, the Transport Department); the industrial accident rate in all industries was 17.2 cases per 1,000 workers (Source: Occupational Safety and Health Statistics 2017, the Labour Department).

Type of accident	**Number of cases**	**Percentage**
Cuts	102	36.0
Heat burns or scalds	141	49.8
Eye accidents	8	2.8
Chemicals on skin	10	3.5
Chemical spillage	3	1.1
Discomfort arising from inhalation of gases	1	0.4
Substances catching fire	4	1.4
Bites by animals	0	0.0
Others	14	4.9
Total	283	

Subject	**Number of cases**	**Percentage**
Science (S1-3)	197	69.6
Biology	33	11.7
Chemistry	45	15.9
Physics	8	2.8
Integrated Science (S4-6)	0	0.0
Total	283	



School year:	2005/06	2008/09	2011/12	2014/15	2017/18
Number of cases:	522	502	348	280	283
Number of schools responded:	464	459	401	412	426